

REMARKS

In a Final Office Action mailed on May 19, 2006, the Examiner: (1) rejected claims 1-4, 6, 12-14, and 41 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim et al., *Macro Model and Sense Amplifier for a MRAM*, Journal of the Korean Physical Society, Vol. 41, No. 6, December 2003, pp. 896-901 and Savtchenko (U.S. Pat. No. 6,545,906); (2) rejected claims 29-31, 33, and 39-40 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim and Das et al., *Universal HSPICE Macromodel for Giant Magnetoresistance Memory Bits*, IEEE Transactions on Magnetics, Vol. 36, No. 4, July 2000 (referred to as Das (2) by the Examiner); (3) rejected claim 5 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim and Savtchenko and further in view of Das et al., *A Generalized HSPICE™ Macro-Model For Pinned Spin-Dependent-Tunneling Devices*, IEEE Transactions on Magnetics, Vol. 35, No. 5, September 1999 (referred to as Das by the Examiner); (4) rejected claims 7 and 15 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim and Savtchenko and further in view of Maxim et al., *A Novel Behavioral Model of SPICE Macromodeling of Magnetic Components Including the Temperature and Frequency Dependencies*, IEEE, 1998; (5) rejected claim 8 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Maxim, and Lancaster et al., *Curve and Space Fitting: An Introduction*; (6) rejected claims 9 and 11 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Maxim, and Dimopoulos, *Transport Polarisé En Spin Dans Les Jontions Tunnel Magnétiques: Le Rôle Des Interfaces Métal/Oxyde Dans Le Processus Tunnel*; (7) rejected claim 10 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Maxim, Dimopoulos, and further in view of Lancaster; (8) rejected claims 16-20, 22, 26-28 and 38 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, and Reiss et al. *Spinelectronics and its applications*; (9) rejected claim 21 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Reiss, and Das; (10) rejected claim 23 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Reiss, and Maxim; and (11) rejected claims 24 and 25 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Reiss, Maxim, and Dimopoulos; (12) rejected claim 32 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Das(2), and Das; (13) rejected claim 34 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Das(2), and Maxim; (14) rejected

claims 24 and 25 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Das(2), and Dimopoulos; and (15) rejected claim 38 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Das(2), and Reiss.

Applicant respectfully traverses the rejection of pending claims 1-36 and 38-41 because the Examiner has failed to establish a prima facie case of obviousness for each of these claims at least for the reasons given below. To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Third, the prior art reference (or references when combined) must teach or suggest all of the claim limitations. M.P.E.P. § 2143. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

With respect to the rejection of claims 1-4, 6, 12-14, and 41 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim and Savtchenko, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least two reasons. First, the purported combination of Kim and Savtchenko fails to teach the dependence of a bit state upon a specific sequence of a plurality of operating conditions. Regarding Kim, the Examiner acknowledges that it fails to teach the dependence of a bit state upon a specific sequence of a plurality of operating conditions. (May 19, 2006 Office Action, page 3, paragraph 6). The Examiner then relies on Savtchenko that it teaches as part of a method for simulating a MRAM, the step of “outputting a bit state that is dependent upon a specific sequence of a status of the plurality of operating conditions.” Applicant respectfully disagrees. Unlike the claimed subject matter, which is directed to a method of simulating a MRAM, Savtchenko is directed to a method for writing an MRAM. (col. 2, ll. 3-16). In this context, Savtchenko teaches two methods for writing to an MRAM: (1) the direct writing method and (2) the toggle writing method. (col. 3, ll. 54-60). According to Savtchenko, these “modes are achieved using the same timed pulse sequence ... but differ in the choice of magnetic sub-layer moment and polarity and magnitude of the magnetic field applied. (col. 3, ll. 57-60). Thus, Savtchenko teaches two different methods of writing to the MRAM; however, it has nothing to do with a method for simulating an MRAM including the step of “outputting a bit state that is dependent upon a

specific sequence of a status of the plurality of operating conditions.” Thus, even if combined with Kim (which it cannot be) the combination does not teach the subject matter of claims 1-4, 6, 12-14, and 41. Accordingly, Applicant respectfully requests the Examiner to withdraw the rejection of claims 1-4, 6, 12-14, and 41 under 35 U.S.C. § 103(a).

Additionally, there is no suggestion or motivation to combine the two references in the manner proposed by the Examiner. The Examiner points to column 2, lines 1-16 of Savtchenko as a basis for why a person of ordinary skill in the art would be motivated to combine Savtchenko with Kim. That portion of Savtchenko, however is merely extolling the virtues of a new and improved method of writing to an MRAM, which is “highly selectable,” has an improved error rate, and has a switching field that is less dependent on shape. (col. 2, ll. 1-16). Applicant respectfully submits that at best a person of ordinary skill in the art would be motivated to use the improved method of writing to the MRAM, but would not be motivated to simulate the MRAM using as claimed. Accordingly, for this additional reason, Applicant respectfully requests the Examiner to withdraw the rejection of claims 1-4, 6, 12-14, and 41 under 35 U.S.C. § 103(a).

Regarding the rejection of claim 5, which indirectly depends from claim 1, under 35 U.S.C. § 103(a) as being obvious over a combination of Kim and Savtchenko and further in view of Das, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least the reasons given above with respect to claim 1.

With respect to the rejection of claims 7 (which indirectly depends from claim 1) and 15 (which depends from claim 1) under 35 U.S.C. § 103(a) as being obvious over a combination of Kim and Savtchenko and further in view of Maxim, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least the reasons given above with respect to claim 1.

Regarding the rejection of claim 8, which indirectly depends from claim 1, under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Maxim, and Lancaster, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least the reasons given above with respect to claim 1.

Concerning the rejection of claims 9 and 11, which indirectly depend from claim 1, under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Maxim, and

Dimopoulos, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least the reasons given above with respect to claim 1.

With respect to the rejection of claim 10, which indirectly depends from claim 1, under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Maxim, Dimopoulos, and further in view of Lancaster, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least the reasons given above with respect to claim 1.

Concerning the rejection of claims 29-31, 33, and 39-40 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim and Das (2), Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least two reasons. First, the purported combination of Kim and Das (2) fails to teach a method for simulating an MRAM, including:

providing a state machine having one or more state variables with transitions in the state machine being dependent upon detected indications of transitions of the first magnetic field and the second magnetic field and a state of the one or more state variables, wherein state variables of the state machine include at least three of:

a state variable indicative of a presence of the first magnetic field above a predetermined threshold;

a state variable indicative of a presence of the second magnetic field above a predetermined threshold;

a state variable indicative of a presence of the first magnetic field above a predetermined threshold preceding a presence of the second magnetic field above a predetermined threshold; and

a state variable indicative of a presence of the second magnetic field above a predetermined threshold preceding a presence of the first magnetic field above a predetermined threshold.

Regarding Kim, the Examiner cites to page 899, column 1, lines 9-20 to conclude that Kim teaches the subject matter, except for the last two elements. Applicant respectfully disagrees with the Examiner's conclusion and reasoning that Kim teaches the above subject matter of claims 29-31, 33, and 39-40. The claimed elements above require "a state variable indicative of a presence of the first magnetic field above a predetermined threshold" and "a state

variable indicative of a presence of the second magnetic field above a predetermined threshold.” The Examiner interprets “stored data are not changed in the amount of current is not sufficient” to mean “a predetermined threshold.” (May 19, 2006 Office Action, page 7, top paragraph, last line). In this regard, Kim teaches “[i]n reality, to write data [to an MRAM], the sum of the fields from the bit line and the digit line has to be sufficient to change the polarization of the MTJ soft layer. Therefore, stored data are not changed if the amount of current is not sufficient.” (page 899, col. 1, ll. 15-20). Thus, Kim is merely teaching a model for an MRAM in which the stored data in the MRAM is not changed unless the amount of current is sufficient to change the polarization of the MTJ soft layer. Applicant respectfully submits that Kim still does not teach “a state variable indicative of a presence of the first magnetic field above a predetermined threshold” and “a state variable indicative of a presence of the second magnetic field above a predetermined threshold.”

Next, the Examiner acknowledges that Kim fails to teach “a state variable indicative of a presence of the first magnetic field above a predetermined threshold preceding a presence of the second magnetic field above a predetermined threshold” and “a state variable indicative of a presence of the second magnetic field above a predetermined threshold preceding a presence of the first magnetic field above a predetermined threshold.” But, then the Examiner relies on Das(2) to conclude that Das(2) teaches this aspect of Applicant’s claimed subject matter. Applicant respectfully disagrees. The cited portion of Das(2) is related to the discussion of “pseudo-spin-valve” behavior. (see section heading). As part of this discussion, Das(2) states that in most pseudo-spin-valve bits, “the uniaxial anisotropy and ‘orange peel’ effect” may dominate over interlayer interaction. (page 2065, section C). Next, Das(2) observes that while this is generally true, “depending on the fabrication details and the dimensions of GMR memory bits, interlayer interaction may start to dominate.” (Id.). Next, as part of the discussion of whether the uniaxial anisotropy and ‘orange peel’ effect or the interlayer interaction dominates, Das(2) states that in case the interlayer interaction dominates, “the soft layer switching thresholds will depend upon the state of the magnetization of the hard layer.” (Id.). As a result of which “the upward gradient of a major loop may *not* at all be equal to the downward gradient of a minor loop; neither the breakpoints would be symmetric.” (Id.). Without an explanation, the Examiner concludes from this that Das(2) teaches “a state variable indicative of a presence of the first magnetic field above a predetermined threshold preceding a presence of the second

magnetic field above a predetermined threshold” and “a state variable indicative of a presence of the second magnetic field above a predetermined threshold preceding a presence of the first magnetic field above a predetermined threshold.” Applicant respectfully submits that Das(2) does not teach or suggest these claimed limitations because at best Das(2) teaches that when interlayer interaction dominates, as shown in Figure 10, the pseudo-spin-valve behavior (as represented as R versus I_w characteristic) may not be as typical as the one shown in Figure 7. Accordingly, at least because both Kim and Das(2), whether taken alone or in combination, fail to teach or suggest “a state variable indicative of a presence of the first magnetic field above a predetermined threshold preceding a presence of the second magnetic field above a predetermined threshold” and “a state variable indicative of a presence of the second magnetic field above a predetermined threshold preceding a presence of the first magnetic field above a predetermined threshold.” Accordingly, Applicant respectfully requests the Examiner to withdraw the rejection of claims 29-31, 33, and 39-40 under 35 U.S.C. § 103(a).

Additionally, there is no suggestion or motivation to combine the two references in the manner proposed by the Examiner. The Examiner points to Das(2) and suggests that because Das(2) and Kim are both related to modeling spin-valve and pseudo-spin-valve GMR bits and because Das(2) reports an improvement over the prior art, persons of ordinary skill in the art would be motivated to combine the two to arrive at the claimed subject matter. Applicant respectfully disagrees. Das(2) as explained above has no teaching whatsoever related to “a state variable indicative of a presence of the first magnetic field above a predetermined threshold preceding a presence of the second magnetic field above a predetermined threshold” and “a state variable indicative of a presence of the second magnetic field above a predetermined threshold preceding a presence of the first magnetic field above a predetermined threshold.” Instead, as explained above, Das(2) is discussing the effect of interlayer interaction on the behavior of GMR bits. Just because Das(2) reports an improvement to the modeling of GMR bits does not mean that a person of ordinary skill in the art would be motivated to combine Das(2) with Kim in the manner proposed by the Examiner. Accordingly, for this additional reason, Applicant respectfully requests the Examiner to withdraw the rejection of claims 1-4, 6, 12-14, and 41 under 35 U.S.C. § 103(a).

Moreover, Even if one were to combine Das(2) and Kim, at best one would arrive at a GMR bit model that incorporates the effect of dominance of interlayer interaction. That

purported combination still does not teach or suggest “a state variable indicative of a presence of the first magnetic field above a predetermined threshold preceding a presence of the second magnetic field above a predetermined threshold” and “a state variable indicative of a presence of the second magnetic field above a predetermined threshold preceding a presence of the first magnetic field above a predetermined threshold.”

Regarding the rejection of claims 16-20, 22, 26-28 and 38 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, and Reiss, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least two reasons. First, for similar reasons as given above with respect to claim 1, neither Kim nor Savtchenko (taken alone or in combination) teaches a method for simulating an MRAM including providing an output bit state for the memory device, the output bit state is dependent upon a specific sequence of a status of the plurality of operating conditions. Second, as explained above with respect to claim 1, there is no motivation or suggestion to combine these two references in the manner proposed by the Examiner. Moreover, Reiss does not cure the deficiency of teachings of Kim and Savtchenko in this respect. In particular, Reiss relates to an explanation of basic physics related to Tunnel Magneto Resistance (TMR) based systems and does not teach or suggest the dependence of a bit state upon a specific sequence of a plurality of operating conditions. Thus, even if combined with Kim and Savtchenko (which they cannot be), the combination does not teach the subject matter of claims 16-20, 22, 26-28 and 38. Accordingly, for at least these reasons Applicant respectfully requests the Examiner to withdraw the rejection of claims 16-20, 22, 26-28 and 38 under 35 U.S.C. § 103(a).

Concerning the rejection of claim 21 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Reiss, and Das, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least similar reasons as given above with respect to claim 16, from which claim 21 depends. In addition, Das does not teach or suggest a method for simulating an MRAM including providing an output bit state for the memory device, the output bit state is dependent upon a specific sequence of a status of the plurality of operating conditions. Thus, Das fails to cure the teachings of the deficiencies of Kim, Savtchenko, and Reiss. Accordingly, Applicant respectfully requests the Examiner to withdraw the rejection of claim 21 under 35 U.S.C. § 103(a).

With respect to the rejection of claim 23 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Reiss, and Maxim, Applicant respectfully submits that as explained above Savtchenko fails to teach the dependence of a bit state upon a specific sequence of a plurality of operating conditions. Reiss and Maxim do not cure the deficiency of teachings of Savtchenko in this respect. Thus, even if combined with Savtchenko (which they cannot be) the combination does not teach the subject matter of claim 23. Accordingly, Applicant respectfully requests the Examiner to withdraw the rejection of claim 23 under 35 U.S.C. § 103(a).

Regarding the rejection of claims 24 and 25 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Savtchenko, Reiss, Maxim, and Dimopoulos, Applicant respectfully submits that as explained above Savtchenko fails to teach the dependence of a bit state upon a specific sequence of a plurality of operating conditions. Reiss, Maxim, and Dimopoulos do not cure the deficiency of teachings of Savtchenko in this respect. Thus, even if combined with Savtchenko (which they cannot be) the combination does not teach the subject matter of claims 24 and 25. Accordingly, Applicant respectfully requests the Examiner to withdraw the rejection of claims 24 and 25 under 35 U.S.C. § 103(a).

Concerning the rejection of claim 32 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Das(2), and Das, Applicant respectfully submits that as explained above Kim fails to teach the dependence of a bit state upon a specific sequence of a plurality of operating conditions. Das does not cure the deficiency of teachings of Kim in this respect. Thus, even if combined with Kim (which they cannot be) the combination does not teach the subject matter of claims 5 and 32. Accordingly, Applicant respectfully requests the Examiner to withdraw the rejection of claim 32 under 35 U.S.C. § 103(a).

With respect to the rejection of claim 34 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Das(2), and Maxim, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least the reasons given above with respect to claims 29 and 30.

Regarding the rejection of claims 24 and 25 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Das(2), and Dimopoulos, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least the reasons given above with respect to claims 16, 18, 19, and 23.

Concerning the rejection of claim 38 under 35 U.S.C. § 103(a) as being obvious over a combination of Kim, Das(2), and Reiss, Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness for at least the reasons given above with respect to claim 29.

For at least the reasons given above, Applicant requests allowance of pending claims 1-36 and 38-41 over the cited references. The Final Office Action contains numerous statements characterizing the claims, the Specification, and the prior art. Regardless of whether such statements are addressed by Applicant, Applicant refuses to subscribe to any of these statements, unless expressly indicated by Applicant. Should issues remain that might be subject to resolution through a telephonic interview, the Examiner is requested to telephone the undersigned at (512) 996-6839.

If Applicant has overlooked any additional fees, or if any overpayment has been made, the Commissioner is hereby authorized to credit or debit Deposit Account 503079, Freescale Semiconductor, Inc.

Respectfully submitted,

SEND CORRESPONDENCE TO:

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